



Draft genome sequences of two *Kocuria* isolates, *K. salsicia* G1 and *K. rhizophila* G2, isolated from a slaughterhouse in Denmark

Herschend, Jakob; Raghupathi, Prem Krishnan; Røder, Henriette Lyng; Sørensen, Søren Johannes; Burmølle, Mette

Published in:
Genome Announcements

DOI:
[10.1128/genomeA.00075-16](https://doi.org/10.1128/genomeA.00075-16)

Publication date:
2016

Document version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Herschend, J., Raghupathi, P. K., Røder, H. L., Sørensen, S. J., & Burmølle, M. (2016). Draft genome sequences of two *Kocuria* isolates, *K. salsicia* G1 and *K. rhizophila* G2, isolated from a slaughterhouse in Denmark. *Genome Announcements*, 4(2), [e00075-16]. <https://doi.org/10.1128/genomeA.00075-16>

Draft Genome Sequences of Two *Kocuria* Isolates, *K. salsicia* G1 and *K. rhizophila* G2, Isolated from a Slaughterhouse in Denmark

Jakob Herschend, Prem K. Raghupathi, Henriette L. Røder, Søren J. Sørensen, Mette Burmølle

Section for Microbiology, Department of Biology, University of Copenhagen, Copenhagen, Denmark

We report here the draft genome sequences of *Kocuria salsicia* G1 and *Kocuria rhizophila* G2, which were isolated from a meat chopper at a small slaughterhouse in Denmark. The two annotated genomes are 2.99 Mb and 2.88 Mb in size, respectively.

Received 10 February 2016 Accepted 12 February 2016 Published 31 March 2016

Citation Herschend J, Raghupathi PK, Røder HL, Sørensen SJ, Burmølle M. 2016. Draft genome sequences of two *Kocuria* isolates, *K. salsicia* G1 and *K. rhizophila* G2, isolated from a slaughterhouse in Denmark. *Genome Announc* 4(2):e00075-16. doi:10.1128/genomeA.00075-16.

Copyright © 2016 Herschend et al. This is an open-access article distributed under the terms of the [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/).

Address correspondence to Mette Burmølle, burmolle@bio.ku.dk.

Kocuria rhizophila and *Kocuria salsicia* are Gram-positive, coccoid, spherical saprotrophic bacteria belonging to the family Micrococcaceae. *Kocuria* species are ubiquitous and highly adapted to their ecological niches (1) and are mainly identified in soil samples (2), clinical specimens (3, 4), fermented food (5, 6), and as members of the oral and skin flora (7). *K. rhizophila* is also commonly used as a standard quality control strain for antimicrobial susceptibility testing (2). Currently, there is one complete genome and one draft genome sequence publicly available of *K. rhizophila*: *K. rhizophila* DC2201 (2) and *K. rhizophila* P7-4 (1). Here, we present the draft assembly of *K. salsicia* G1 and *K. rhizophila* G2, isolated from a slaughterhouse in Denmark (8).

The whole-genome sequencing libraries were prepared using the Nextera XT kit (Illumina, USA), according to the manufacturer's recommendations, and then sequenced as part of the flow cell, as 2 × 250-base paired-end reads using the Illumina MiSeq (Illumina) technology. The reads were cleaned and trimmed using CLC Genomics Workbench 7 (CLC bio, Denmark). Quality-filtered reads were assembled using SPAdes version 3.5.0 (9). The annotations on the resulting contigs were performed on the RAST server (10) and RNAmmer 1.2 (11) to check and screen for non-coding RNAs.

The assembly of *K. salsicia* G1 resulted in 199 contigs at 27× coverage, with an average G+C content of 70.43%. *K. rhizophila* G2 is assembled into 87 contigs at 126× coverage, with an average G+C content of 70.81%. The annotated results from G1 predicted 2,565 coding sequences, with an average length of 971 bp (1,172 coding sequences [CDSs] have functional predictions), 19 tRNA-coding genes, and 5 rRNA-coding genes. The predictions from G2 included 2,531 coding sequences, with an average length of 955 bp (1,154 CDSs have functional predictions), 18 tRNA-coding genes, and 7 rRNA-coding genes. Both strains had single predicted copies of 16S and 23S rRNA genes, with the only difference in 5S rRNA gene copies, with 3 for G1 and 5 for G2. There are 359 and 358 predicted subsystems in the genomes of G1 and G2, respectively. Metabolic network comparisons revealed 1,774 putative protein-encoding genes (PEGs) conserved in both G1 and G2 genomes. In a function-based comparison to the genome of DC2201, the genomes of G1 had 179 unique PEGs and 147 PEGs

in G2. The main differences observed in a comparison of *K. salsicia* G1 to *K. rhizophila* DC2201 and *K. rhizophila* G2 were the presence of sequences encoding clustered regularly interspaced short palindromic repeat (CRISPR) elements, iron acquisition, and metabolism subsystems identified in G1 only. These suggest a prominent influence of phage exposure and possible adaptation mechanisms of isolate G1 to a more densely populated environment, such as the animal gut. Further work with these genomes is expected to facilitate the identification and understanding of genes associated with adaptive mechanisms of these strains and biofilm formation.

Nucleotide sequence accession numbers. The whole-genome sequencing (WGS) projects for *K. salsicia* G1 and *K. rhizophila* G2 have been deposited at the European Nucleotide Archive (ENA) under the contig accession numbers CZJU01000001 to CZJU01000199 and CZJW01000001 to CZJW01000087, respectively. The versions described in this paper are the first versions.

FUNDING INFORMATION

This work was funded partly by the Danish Council for Independent Research and the Villum Foundation.

REFERENCES

- Kim WJ, Kim YO, Kim DS, Choi SH, Kim DW, Lee JS, Kong HJ, Nam BH, Kim BS, Lee SJ, Park HS, Chae SH. 2011. Draft genome sequence of *Kocuria rhizophila* 7-4. *J Bacteriol* 193:4286–4287.
- Takarada H, Sekine M, Kosugi H, Matsuo Y, Fujisawa T, Omata S, Kishi E, Shimizu A, Tsukatani N, Tanikawa S, Fujita N, Harayama S. 2008. Complete genome sequence of the soil actinomycete *Kocuria rhizophila*. *J Bacteriol* 190:4139–4146. <http://dx.doi.org/10.1128/JB.01853-07>.
- Becker K, Rutsch F, Uekötter A, Kipp F, König J, Marquardt T, Peters G, Von Eiff C. 2008. *Kocuria rhizophila* adds to the emerging spectrum of micrococcal species involved in human infections. *J Clin Microbiol* 46:3537–3539. <http://dx.doi.org/10.1128/JCM.00823-08>.
- Dunn R, Bares S, David MZ. 2011. Central venous catheter-related bacteremia caused by *Kocuria kristinae*: case report and review of the literature. *Ann Clin Microbiol Antimicrob* 10:31. <http://dx.doi.org/10.1186/1476-0711-10-31>.
- Yun JH, Roh SW, Jung MJ, Kim MS, Park EJ, Shin KS, Do Nam YD, Bae JW. 2011. *Kocuria salsicia* sp. nov., isolated from salt-fermented seafood. *Int J Syst Evol Microbiol* 61:286–289. <http://dx.doi.org/10.1099/ijs.0.021469-0>.
- Park EJ, Kim MS, Roh SW, Jung MJ, Bae JW. 2010. *Kocuria atrinae* sp.

- nov., isolated from traditional Korean fermented seafood. *Int J Syst Evol Microbiol* 60:914–918. <http://dx.doi.org/10.1099/ijs.0.014506-0>.
7. Szczerba I. 2003. Occurrence and number of bacteria from the *Micrococcus*, *Kocuria*, *Nesterenkonia*, *Kytococcus* and *Dermacoccus* genera on skin and mucous membranes in humans. *Med Dosw Mikrobiol* 55:67–74.
 8. Røder HL, Raghupathi PK, Herschend J, Brejnrod A, Knøchel S, Sørensen SJ, Burmølle M. 2015. Interspecies interactions result in enhanced biofilm formation by co-cultures of bacteria isolated from a food processing environment. *Food Microbiol* 51:18–24. <http://dx.doi.org/10.1016/j.fm.2015.04.008>.
 9. Bankevich A, Nurk S, Antipov D, Gurevich AA, Dvorkin M, Kulikov AS, Lesin VM, Nikolenko SI, Pham S, Prjibelski AD, Pyshkin AV, Sirotkin AV, Vyahhi N, Tesler G, Alekseyev MA, Pevzner PA. 2012. SPAdes: a new genome assembly algorithm and its applications to single-cell sequencing. *J Comput Biol* 19:455–477.
 10. Overbeek R, Olson R, Pusch GD, Olsen GJ, Davis JJ, Disz T, Edwards RA, Gerdes S, Parrello B, Shukla M, Vonstein V, Wattam AR, Xia F, Stevens R. 2014. The SEED and the rapid annotation of microbial genomes using subsystems technology (RAST). *Nucleic Acids Res* 42: D206–D214. <http://dx.doi.org/10.1093/nar/gkt1226>.
 11. Lagesen K, Hallin P, Rødland EA, Staerfeldt H-H, Rognes T, Ussery DW. 2007. RNAmmer: consistent and rapid annotation of ribosomal RNA genes. *Nucleic Acids Res* 35:3100–3108. <http://dx.doi.org/10.1093/nar/gkm160>.